

Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004-2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG):

R4PRTGn

Northern Tallgrass Prairie

General Information

Contributors (additional contributors may be listed under "Model Evolution and Comments")

Modelers

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Vegetation Type

Grassland

Dominant Species*

ANGE SPHE
PAVI2 STSP2
KOMA
ELTRS

General Model Sources

- Literature
 Local Data
 Expert Estimate

LANDFIRE Mapping Zones

39
40

Rapid Assessment Model Zones

- | | |
|---|--|
| <input type="checkbox"/> California | <input type="checkbox"/> Pacific Northwest |
| <input type="checkbox"/> Great Basin | <input type="checkbox"/> South Central |
| <input type="checkbox"/> Great Lakes | <input type="checkbox"/> Southeast |
| <input type="checkbox"/> Northeast | <input type="checkbox"/> S. Appalachians |
| <input checked="" type="checkbox"/> Northern Plains | <input type="checkbox"/> Southwest |
| <input type="checkbox"/> N-Cent.Rockies | |

Geographic Range

This type is located in and around the Red River Valley in eastern North Dakota, northwestern Minnesota, and southern Manitoba. This type encompasses Bailey's Ecoregion 251, but extends further west to the James River.

Biophysical Site Description

Soils are typically deep mollisols. Surface soil textures are primarily loam, silt loam, and silty clay loam and the landscape is level to gently rolling. Glacial activity shaped the landscape of this type and landforms of the region reflect this. They are primarily glacial lakeplains, alluvial outwash fans, beach ridges. Precipitation ranges from 17-25 inches.

Vegetation Description

This system is dominated by the common tallgrass species *Andropogon gerardii* and *Panicum virgatum* (Weaver 1954). The northern character of this type is reflected in the lesser abundance of *Sorghastrum nutans* compared to tallgrass prairies further south (Carpenter 1940, Smeins and Olsen 1967) and the generally higher abundance of species such as *Elymus trachycaulus* ssp. *Subsecundus*, *Elymus canadensis*, *Koeleria macrantha*, *Stipa spartea*, and *Sporobolus heterolepis*. The grasses are characteristically tall (~1-2 meters) and canopy cover is dense. Wetter areas and lowlands have species such as *Spartina pectinatus* and *Carex* spp. Scattered trees and shrubs (e.g. *Populus* spp., *Quercus* spp., *Salix* spp., *Alnus* spp., *Corylus* spp.) occur in this type with more in the more mesic eastern portions. In the west more cool season and midgrasses become more dominant (i.e. *Pascopyrum smithii*).

Disturbance Description

Fire was the dominant disturbance in this type. Fire return interval was short with stand replacement fires occurring approximately every 6 years on average. Herbivory by large mammals was also a factor in shaping the character of the Northern Tallgrass Prairie. Large mammals preferentially grazed recently

*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

burned sites keeping the vegetation low and providing fire breaks across the landscape. Without disturbance, most sites with Northern Tallgrass Prairie will succeed to shrubland or woodland.

Adjacency or Identification Concerns

This type is similar to the Central Tallgrass Prairie (R4PRTGc) which abuts it to the south. It grades into the Northern Mixed Prairie (R4PRMGn) to the west, and into Oak Savanna (R4OASA), and aspen parklands to the east.

Scale Description

Sources of Scale Data Literature Local Data Expert Estimate

Disturbance varied widely in size. Fires ranged from local (tens of acres) to landscape level (thousands of acres).

Issues/Problems

There is limited information specifically on the northern tallgrass prairie areas versus the tallgrass prairie in general. We used some tallgrass prairie information, modifying it for the estimated effects of higher latitudes. Our estimates of disturbance patch size and effect of grazing need review, especially.

Model Evolution and Comments

Succession Classes
Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).

Class A 15%

Early1 All Structures

Description

Post fire community from immediately after a replacement fire until one year after the fire. Immediately following the fire, there are no above ground plants and no litter. Plants emerge within weeks and by the end of the year the grasses range from 1- 1.75 meters high. Ideally, this stage would only last 3 months, but the model constrains the time interval to be at least one year. The modelers had trouble with this model working - particularly its transition to Class C, so they made this class last 2 years to make the model function properly. Dominant species are those common to the Northern Tallgrass Prairie - *Andropogon gerardii*, *Panicum virgatum*, *Koeleria macrantha*, and *Stipa spartea*. Forbs, such as *Zizadenus elegans*, are more abundant in the immediate post-fire vegetation

Indicator Species* and Canopy Position

ANGE Upper
 PAVI2 Upper

 STSPE Upper

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model 1

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	70 %
Height	no data	Herb Tall > 1m
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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Class B 44%

Mid1 Closed

Description

Class B is the successional state from Class A in absence of fire, grazing, or other disturbance. The structure is more closed and taller, there is some thatch buildup but this is still limited due to the limited time since fire. Tall grasses are dominant, woody vegetation (shrubs and trees) are widely scattered and limited to micro sites that escaped fire or to mature fire resistant trees. Both of these occur more commonly in the eastern parts of this Type. Dominant species are those common to the Northern Tallgrass Prairie - *Andropogon gerardii*, *Panicum virgatum*, *Sorghastrum nutans*, and *Stipa spartea*.

Indicator Species* and Canopy Position

ANGE Upper
PAVI2 Upper
SONU2 Upper
STSPE Upper

Upper Layer Lifeform

- Herbaceous
 Shrub
 Tree

Fuel Model 3**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	80 %	100 %
Height	Herb Tall > 1m	Herb Tall > 1m
Tree Size Class	no data	

- Upper layer lifeform differs from dominant lifeform.
Height and cover of dominant lifeform are:

Class C 15%

Mid1 Open

Description

Post-grazing stage with grasses and forbs grazed and kept to a low stature. Graminoids are abundant but the forb component is higher in this stage than others. There were a wide diversity of early successional forbs, such as *Artemisia ludoviciana* and *Ambrosia artemisifolia*. The graminoid species common to this Type, *Andropogon gerardii*, *Panicum virgatum*, *Koeleria macrantha*, and *Stipa spartea*, are still present but much shorter and in somewhat less abundance.

Indicator Species* and Canopy Position

ARLU Upper
ANGE Upper
PAVI2 Upper
AMAR2 Upper

Upper Layer Lifeform

- Herbaceous
 Shrub
 Tree

Fuel Model 1**Structure Data (for upper layer lifeform)**

	Min	Max
Cover	50 %	80 %
Height	Herb Short <0.5m	Herb Medium 0.5-0.9m
Tree Size Class	no data	

- Upper layer lifeform differs from dominant lifeform.
Height and cover of dominant lifeform are:

Class D 22%

Late1 Closed

Description

Late-stage tall grass prairie. Sites in this class are beyond the normal fire return interval. Litter buildup is high and fires in this class would likely be intense. Woody vegetation is still limited but increases with time since fire. This class will have more of a woody component than other classes except class E. Dominant species are those common to the Northern Tallgrass Prairie - Andropogon gerardii, Koeleria macrantha, Panicum virgatum, and Stipa spartea.

Indicator Species* and Canopy Position

ANGE Upper
PAVI2 Upper

STSPE Upper

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	Max
Cover	90 %	100 %
Height	Herb Tall > 1m	Herb Tall > 1m
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E 4%

Late1 All Structures

Description

Shrub/scrub where woody species have been able to become dominant through lack of disturbance (fire and/or intense grazing). Grazing disturbance is replaced by browsing. Quaking aspen (Populus tremuloides), bur oak (Quercus macrocarpa), willow (Salix spp.), hazel (Corylus spp.), and alder (Alnus spp.) are the most common and can form dense thickets, although the bur oak and quaking aspen are small in size and make up 2-5% of the class. trees Grasses are still abundant in the understory and include Andropogon gerardii, Panicum virgatum, Koeleria macrantha, and Stipa spartea.

Indicator Species* and Canopy Position

POTR5 Upper
QUMA2 Upper
SALIX Upper
ANGE Middle

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model 2

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	100 %
Height	Shrub Medium 1.0-2.9m	Tree Short 5-9m
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

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Non-Fire Disturbances Modeled

- Insects/Disease
- Wind/Weather/Stress
- Native Grazing
- Competition
- Other:
- Other:

Fire Regime Group: **2**

- I: 0-35 year frequency, low and mixed severity
- II: 0-35 year frequency, replacement severity
- III: 35-200 year frequency, low and mixed severity
- IV: 35-200 year frequency, replacement severity
- V: 200+ year frequency, replacement severity

Historical Fire Size (acres)

Avg: 10000
 Min: 10
 Max: 100000

Fire Intervals (FI):

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class. All values are estimates and not precise.

Sources of Fire Regime Data

- Literature
- Local Data
- Expert Estimate

	<i>Avg FI</i>	<i>Min FI</i>	<i>Max FI</i>	<i>Probability</i>	<i>Percent of All Fires</i>
<i>Replacement</i>	6.5	1	25	0.15385	89
<i>Mixed</i>	63			0.01587	9
<i>Surface</i>	303			0.00330	2
<i>All Fires</i>	6			0.17302	

References

Carpenter, J.R. 1940. The Grassland Biome. Ecological Monographs 10(4): 617-684.

Rowe, J.S. 1969. Lightning fires in Saskatchewan grasslands. Canadian Field Naturalist. 83: 317-327.

Smeins, F.E. and D.E. Olsen. 1967. Species Composition and Production of a Native Minnesota Tall Grass Prairie. American Midland Naturalist 84(2): 398-410.

Weaver, J.E. 1954. North American Prairie. Johnson Publishing Company, Lincoln, NE. 348 pp.

Wright, H.A. and A.W. Bailey. 1982. Fire Ecology: United States and Canada. John Wiley and Sons, New York. 501 pp.

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